

III. Equipment

Brooms

(Specification 2001.14)

Brooms are used for cleaning and preparation of base pavement. They provide a surface free of foreign material, which increases the bond between the existing pavement and HMA resurfacing. Brooms shall be of the rotary type, and the broom shall be driven by an auxiliary motor or by a power takeoff (PTO) from the power plant of the unit propelling the broom.



Some brooms are equipped with water spray bars, to help control fugitive dust generated during sweeping. In other (typically urban) situations, a “street sweeper” unit with an on-board dust and dirt collection system may be utilized.



Tack Distributor

(Specifications 2001.11 & 2001.12)

Tack distributors shall be mounted on motor trucks or trailers. Distributors shall be equipped with adequately sized burners for heating the bituminous material and with a means of circulating the material when the burners are in operation. Each unit shall be equipped with an accurate thermometer for indicating the temperature of the bitumen in the tank. The distributor shall be capable of distributing bitumen at rates varying for 0.03 to 0.05 gallons per square yard. The size of the spray nozzles shall be such that bitumen may be spread in a uniform coating without the forward speed exceeding 20 mph. The spray bars must be adjustable for the widths of application required by the work.



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The contractor shall provide the manufacturer's instructions for each distributor, including specific recommendations for the following:

- Spray bar height above road surface.
- Nozzle size and angle of spray fan with spray bar axis.
- Tables showing rates of distribution for corresponding tachometer readings, spray bar pressure, or pump revolutions, and for various widths of spray bars.

The tanks of all distributors shall either be calibrated or have their manufacturer's calibration verified by Iowa DOT Materials before initial use. Distributor calibrations shall be certified annually thereafter.

Trucks

(Specifications 2001.01 & 2001.03)

Various types of trucks are used to deliver hot mix asphalt to the job site. The two most common types used are end-dump trucks and bottom-dump trucks. End-dump trucks deposit their loads directly into the paver hopper. Bottom-dump or "belly-dump" trucks deposit the hot mix in a windrow in front of the paver. Other types of hot mix delivery equipment include semi-trailer dump trucks and horizontal discharge (also called "flow-boy" or live-bottom) trailers.

Hot mix asphalt must be transported in trucks with tight metal or metal-lined dump bodies. For hot mixes on unusually long hauls or for work after October 1, the engineer may require the truck bodies to be insulated to retain heat in the mixture. The insulation must be solidly attached to vertical sides only, with no broken or worn through sheets allowed. All trucks are



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required to be equipped with canvas covers (tarps), but covering is not normally required between May 15 and October 1.

Truck bodies are to be kept clean by heating, scraping or by use of an approved release agent described in Materials IM 491.15.

When kerosene, distillates, or other solvents are used, the trucks must be allowed to drain for a minimum of 5 hours before being used.

Paver

(Specification 2001.19)

Pavers are machines designed to place and initially compact an HMA mixture on the roadway to a specified depth. The paver must be self-propelled for laying widths of 8 feet or more, and mounted on crawler treads or pneumatic tires. The paver shall be designed to pass over small irregularities in the existing base without sharp vertical movements. The two major parts of a typical HMA paver are the tractor unit and the screed unit.

Tractor Unit

The tractor unit provides the moving power for paver wheels or tracks and for all powered machinery on the paver. In operation, the tractor unit's power plant propels the paver, pulls the screed unit, and provides power to other components through various transfer devices.

Screed Unit

The screed unit has two major functions. It strikes off the mix in a manner that meets specifications for thickness and smoothness and it provides initial compaction of the mixture. The screed unit shall be attached to the tractor unit in such a manner that it is free floating on the mixtures being placed.



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The screed must have vibrators and run at the frequency recommended by the manufacturer. Vibrators have essentially replaced the tamper bars found on earlier pavers, though a few models may be equipped with both. Screed extensions may be used, provided each has a screed plate with vibration. If the screed is extended more than one foot, the augers must also be extended.

The paver must be equipped with automatic screed controls to regulate mat thickness and crown shape. The automatic controls shall have grade and slope control systems, which are required to work in conjunction with a ski-type device, traveling stringline, or other approved grade referencing system.



Rollers

(Specification 2001.05)

Self-propelled rollers are required for the compaction of hot mix asphalt. Typical self-propelled compaction rollers consist of the following types:



Vibratory Rollers

Self-propelled vibratory rollers provide compactive force by a combination of weight and vibration of their steel drums. Vibratory rollers achieve compaction through a combination of three factors: dead weight, impact forces (roller vibration), and vibration response in the mixture. To ensure smoothness under vibratory compaction, the frequency (the number of vibrations or downward impacts per minute) and the roller speed should be matched to result in a minimum of 10 impacts per linear foot. The manufacturer's handbook should be available to the operator. Water spray bars and wetting pads are used to prevent adhesion to the drums. Scraper bars are



also utilized to remove any particulate matter that may build up on the drum.

Pneumatic-Tired Rollers

Self-propelled, pneumatic-tired rollers have rubber tires instead of steel tires or drums. They generally feature two tandem axles, with 3 to 4 tires on the front axle and 4 to 5 tires on the rear axle. The wheels oscillate; that is, they move up and down independently of one another. The tires must be no smaller than the 7.50 X 15 size. Tire pressures must not vary by more than 5 psi. The rollers must be capable of producing contact pressures of 80 psi with a legal axle load. The roller shall be equipped with wheel sprinklers, scrapers, or mats, and during cooler weather, protective skirting around the tires to retain heat.



Smooth Steel-Wheeled (Static) Rollers

Self-propelled, smooth steel-wheeled rollers may be three-wheel type, two axle tandem type, or three axle tandem type. The driving roller must not be less than 60 inches in diameter. On tandem type rollers, the driving drum shall be capable of being filled with liquid ballast. Water spray bars and wetting pads are used to prevent adhesion to the drums. Scraper bars are also utilized to remove any particulate matter that may build up on the drum.



Windrow Pickup Elevator

(Construction Manual section 8.80)

Use of windrow pickup equipment is becoming more common in Iowa. With this process, hot HMA is deposited in a windrow onto the existing pavement surface using bottom dump trailers. A windrow pickup elevator deposits the material into the paver hopper. The primary advantages of this method are contractor efficiency, uniform



speed of the operation, and elimination of delivery trucks bumping into the paver.

The contractor must balance HMA delivery with mat placement rate to keep the paver hopper at a uniform level, which helps avoid segregation. Balancing delivery and placement minimizes the need to either feed the hopper additional mix or remove excess mix from in front of the machine. It is also important that the contractor picks up all windrow material from the pavement surface and not allow the windrow to extend more than two truckloads in front of the paver to avoid excessive cooling of the mix. Windrow length must be shortened if paving during cool or windy conditions.

The windrow pickup process can be used successfully for the lower lift of a full depth pavement; however, it is important to make sure the pickup machine does not disturb (pick up) the subgrade or subbase material.

Material Transfer Vehicle (MTV) (Construction Manual section 8.80)

Material Transfer Vehicles (MTV's) provide mix surge capacity, which allows more constant paver speed and a more efficient paving operation. These vehicles operate in front of or beside the paver and receive loads of hot HMA from delivery trucks. An MTV operates as a mobile HMA surge bin that remixes the HMA and continually feeds the paver hopper. Use of this vehicle results in a smoother pavement by minimizing paver stops and eliminating trucks bumping into the paver. Segregation is virtually eliminated, and a more uniform surface and pavement density is typically achieved.

The main disadvantage of MTV's is weight. The equipment is very heavy and often



exceeds the load-carrying capacity of the roadway or bridges over which it must travel. Before an MTV can be used on a DOT project, approvals must be received from the Office of Design and the Office of Bridges and Structures through the Office of Construction. The contractor must initiate the approval process through the Resident Construction Engineer's office, preferably no later than the preconstruction conference. The approval may be subject to load (hopper level) restrictions, depending on results of the analyses of existing pavement and/or structures. In addition, applicable permits must be obtained for moving the vehicles to and from the project on the open highway, to insure compliance with Code of Iowa weight laws.



MTV use must be closely monitored, and discontinued if evidence of detrimental distress in the base or underlying pavement is observed. Such distresses would typically show up as deformation / rutting of base in full depth paving, or cracking and joint movement in existing pavement during an HMA overlay. The contractor is responsible for repairing any damage to existing pavement or base caused by MTV operation.

Mat Smoothness Machine

(Construction Manual section 8.80)

Mat smoothness machines are similar to MTV's, but on a smaller scale. They consist of an HMA receiving hopper and elevator that deposits hot HMA into the paver hopper. Mat smoothness machines typically are pushed by the paver and do not require a separate operator. This can be a drawback, however, in that additional skills are required on the part of the paver operator in order to successfully steer the unit being pushed ahead of the paver.



Use of a mat smoothness machine allows for more consistent paver operation, by providing some surge capacity for the paver. It can also help remix the material and minimize segregation effects.

Weight restrictions are usually not a concern with this piece of equipment.